

CLAIMS

What is claimed is:

1. A network device, comprising:

5 bridging logic operative, when enabled, to function as a data link layer bridge by (i) receiving data link layer messages from first and second communications links coupled to the network device, the first and second communications links forming part of a single network-layer network segment, and (ii) forwarding the
10 messages received from either one of the communications links to the other communications link;

routing logic operative, when enabled, to function as a network layer router by (i) receiving network layer messages from the first and second communications links, the first and second
15 network links forming respective different network-layer network segments, and (ii) selectively forwarding the network layer messages received from either one of the communications links to the other communications link based on a routing algorithm and respective network layer network addresses in the received network
20 layer messages; and

selection logic operative during operation of the network device to (i) enable the bridging logic and disable the routing logic under a first set of operating conditions, and (ii) enable the routing logic and disable the bridging logic under a second
25 set of operating conditions.

2. A network device according to claim 1, wherein the first set of operating conditions includes the condition that less than a predetermined number of link numbers are available for use as part
30 of a network-layer address prefix for one of the communications links.

3. A network device according to claim 1, wherein the second set of operating conditions includes the condition that the number of nodes residing on the first and second communications links collectively exceeds a predetermined threshold number.

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4. A network device according to claim 3, wherein the selection logic is operative to track the number of nodes on the first and second communications links, and to autonomously decide to enable the routing logic and disable the bridging logic.

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5. A network device according to claim 1, wherein the selection logic is operative to autonomously determine whether the first set of operating conditions are met.

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6. A network device according to claim 1, wherein the selection logic is operative to cooperate with another network device in a common network region in determining whether the first set of operating conditions are met.

7. A network device according to claim 1, wherein the determination of whether the first set of operating conditions are met is made by a separate network device in a common network region, and wherein the selection logic is operative to enable the bridging logic and disable the routing logic in response to a control message received from the separate network device.

8. A network device according to claim 1, wherein (i) the first and second communications links are part of a group of three or more communications links coupled to the network device with respect to which bridging and routing functionality can be selected, (ii) the selection logic is further operative in accordance with a predetermined selection algorithm to select the communications links in the group that are to have their respective routing and bridging functions enabled and disabled.

9. A network device according to claim 8, wherein the predetermined algorithm for selecting communications links under the first set of operating conditions includes selecting a pair of communications links collectively having fewer attached nodes than any other pair of communications links in the group.

10. A network device according to claim 8, wherein the predetermined algorithm for selecting communications links under the second set of operating conditions includes selecting the communications links included in the network segment having more attached nodes than any other network segment defined by communications links in the group.

11. A method of operating a network device, comprising:

performing the function, when enabled, of a data link layer bridge by (i) receiving data link layer messages from first and second communications links coupled to the network device, the first and second communications links forming part of a single network-layer network segment, and (ii) forwarding the messages received from either one of the communications links to the other communications link;

performing the function, when enabled, of a network layer router by (i) receiving network layer messages from the first and second communications links, the first and second network links forming respective different network-layer network segments, and (ii) selectively forwarding the network layer messages received from either one of the communications links to the other communications link based on a routing algorithm and respective network layer network addresses in the received network layer messages; and

operation of the network device, (i) enabling the bridge function and disabling the router function under a first set of operating conditions, and (ii) enabling the router function and

disabling the bridge function under a second set of operating conditions.

12. A computer program product including a computer readable medium, the computer readable medium having a network router/bridge program stored thereon for execution in a computer functioning as a network node, the network router/bridge program comprising:

program code operative, when enabled, to function as a data link layer bridge by (i) receiving data link layer messages from first and second communications links coupled to the network node, the first and second communications links forming part of a single network-layer network segment, and (ii) forwarding the messages received from either one of the communications links to the other communications link;

program code operative, when enabled, to function as a network layer router by (i) receiving network layer messages from the first and second communications links, the first and second network links forming respective different network-layer network segments, and (ii) selectively forwarding the network layer messages received from either one of the communications links to the other communications link based on a routing algorithm and respective network layer network addresses in the received network layer messages; and

program code operative during operation of the network node to (i) enable the bridge program code and disable the router program code under a first set of operating conditions, and (ii) enable the router program code and disable the bridge program code under a second set of operating conditions.

13. A computer data signal including a network router/bridge program for execution in a computer functioning as a network node, the network router/bridge program comprising:

program code operative, when enabled, to function as a data link layer bridge by (i) receiving data link layer messages from first and second communications links coupled to the network node, the first and second communications links forming part of a single network-layer network segment, and (ii) forwarding the messages received from either one of the communications links to the other communications link;

program code operative, when enabled, to function as a network layer router by (i) receiving network layer messages from the first and second communications links, the first and second network links forming respective different network-layer network segments, and (ii) selectively forwarding the network layer messages received from either one of the communications links to the other communications link based on a routing algorithm and respective network layer network addresses in the received network layer messages; and

program code operative during operation of the network node to (i) enable the bridge program code and disable the router program code under a first set of operating conditions, and (ii) enable the router program code and disable the bridge program code under a second set of operating conditions.

14. A network device, comprising:

means for functioning, when enabled, as a data link layer bridge by (i) receiving data link layer messages from first and second communications links coupled to the network device, the first and second communications links forming part of a single network-layer network segment, and (ii) forwarding the messages received from either one of the communications links to the other communications link;

means for functioning, when enabled, as a network layer router by (i) receiving network layer messages from the first and second communications links, the first and second network links forming respective different network-layer network segments, and

(ii) selectively forwarding the network layer messages received from either one of the communications links to the other communications link based on a routing algorithm and respective network layer network addresses in the received network layer messages; and

means operative during operation of the network device for (i) enabling the bridge function and disabling the router function under a first set of operating conditions, and (ii) enabling the router function and disabling the bridge function under a second set of operating conditions.